Contr. Univ. Michigan Herb. 19: 63–82. 1993.

NEW SPECIES OF HAWAIIAN PTERIDOPHYTES [1]

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The best treatment of the ferns and fern allies of Hawaii is still that of Hillebrand (1888) over a century ago. Except for a few monographic studies and reports on individual species, the knowledge of the lower vascular plants of these islands has lagged behind that of the flowering plants.

Intensive field and herbarium studies of Hawaiian pteridophytes since 1984 have revealed a number of taxa, both orthospecies (presumed divergent or cladistic species), varieties (geographically correlated species divisions), and nothospecies (species produced by hybridization), in addition to numerous new nomenclatural changes. It is planned to embody these in a projected manual of the pteridophytes of Hawaii, including approximately 225 native and naturalized orthospecies, varieties, and nothospecies. The purpose of the present paper is to describe some of the newly recognized taxa. Isotypes will be deposited in the Bishop Museum Herbarium (BISH).

Arachniodes insularis W. H. Wagner, sp. nov.

Arachniodes squamis rhizomatis dense confertis, pallide rufis, usque ad 1.3 × 0.5 cm; frons deltato-ovata, usque ad 1.3 m alta, 3–4 (–5)-pinnata, versus apicem gradatim deminuens; sporae praeter modum grandes, circa 60 (50–70) μm longae.

Leathery, finely dissected terrestrial fern. Rhizome short-creeping, 3–7 × 2–5 cm including stipe bases, scales, and roots. Stem scales narrowing gradually to tip, 0.8–1.3 × 0.2–0.5 mm (at base), rather pale reddish brown. Frond ovate-deltate, 0.3–1.3 × 0.1–0.6 m including stipe. Stipe 35–75 cm, with sparse, light-brown scales, but densely scaly in lowest 3–20 cm. Blade 3–4 (–5)-pinnate, the branching anadromous, i.e., the basal acroscopic segments of the pinnae and pinnules appearing first along the axes. Frond tip formed by steady reduction in symmetry. Basiscopic pinnules of lowest pinnae ca. 2× the length of the acroscopic pinnules. Rachis and costae bearing few scattered narrow fibrils 2–3 (–4) cm long. Pinnules elongate-dentate 2–3 (–4) pinnate, the medial ones 10–20 × 3–7 cm. Lamina texture coriaceous. Segment and lobe tips slightly aristate. Color dark shiny green above, slightly paler below. Venation free. Sori round, 0.8–1.2 mm diameter. Indusium leathery, reniform. Spores unusually large, ca. 60 (50–70) mm long. Chromosome number: $n = 82$.

HOLOTYPE: E. Maui, SW side of Makawao Forest Reserve along Olinda Pipeline Road. Common in dense woods on rocky stream banks. 6 July 1947. *Wagner 5185* (MICH).

[1] This study is dedicated to Mr. Edwin Bonsey. He was born in Olmsted Falls, Ohio, in 1885, and died in Hilo, Hawaii, in 1978. He was a long time teacher of science in Wailuku, Maui, and his home in Makawao, Maui, was a center for visiting botanical researchers for many years. Without his help, many botanical projects would have been impaired. His knowledge of the flora and the habitats of Haleakala was unmatched, and his commemoration in the naming of Bonsey's Holly Fern is not only merited, but is a token of the gratitude of many botanists.

Other collections: Hawaii: E slope of Mauna Loa. Woods, near Kulani, ±1400 m. 28 June 1915. *Forbes 978-H* (MICH, 2 sheets).—Oahu: Punahou, 800 m. May 1910. *Faurie 362* (MICH).—W. Maui: Hanaula. Area near reservoir. Frequent along trail. 25 March 1987. *Wagner 87115 et al.* (MICH).

The holotype (Fig. 1) is a rather small-fronded individual but was selected for its excellent rhizome showing the characteristic scales. The plant is generally rare, and found at high altitudes in wet forest, and seems to be most common on Maui. *Arachniodes insularis* has no immediate relatives in the Hawaiian Islands. Concentrated in the mountains of warm parts of central and eastern Asia, the genus is widely distributed but poorly known; it is discussed by Kramer (1990). The main distinguishing marks of the new species (formerly identified with such names as *Rumohra carvifolia* (Kunze) Ching, *Polystichum carvifolium* (Kunze) C. Chr., or *Aspidium aristatum* Sw.) are as follows: Rhizome scales large (up to 1.3 × 0.5 cm) and rather pale reddish brown; ovate deltate fronds up to well over 1 m tall, 3–4 (–5) pinnate, and gradually reduced to the tip; and the unusually large spores (50–70 μm).

Asplenium hobdyi W. H. Wagner, sp. nov.

Species *A. normali* similis sed rachidi supra aliquot proliferationibus instructa; pinnae oblongae, 5–12 mm longae, apice plerumque truncato, auricula basili mediocriter evoluta, margine antico 3–5 prominentiis humilibus instructo.

Tufted ferns of dark damp forest. Rhizome up to 1.5 × 1.0 cm including stipe bases. Stem scales 1.0–1.4 × 0.2–0.4 mm, inconspicuous or invisible, buried among stipe bases and roots, black, triangular. Fertile fronds 10–40 × 0.5–2.0 cm. Blade linear, 1-pinnate. Stipes clustered, up to 12 per plant, glabrous at maturity except at extreme base. Pinnae oblong, 0.5–1.2 × 0.4–0.6 cm, blunt-tipped, dimidiate, the anterior basal auricle absent or poorly developed, shallow and rounded. Margins coarsely and shallowly crenate, not or only slightly overlapping rachis. Texture rather leathery. Veins rather conspicuous, up to 6 on anterior side of pinna, only 1 or 2 on basal side nearly parallel to costa. Rachis proliferations up to 6 per frond proximal from nonproliferous tip. Sori 2.5–3.5 mm long, mostly on the 2–5 veins on the distal side of the pinna, 0–2 on the lower side. Indusium somewhat leathery and conspicuous. Chromosome number: $n = 72$.

Holotype: E. Maui, Waikamoi, near Olinda Pipeline Trail. Abundant at mouth of dark, wet, rock cave. 27 March 1987. *Wagner 87164* (MICH).

Other collections: Molokai: Head of Waikola Valley, Hanalilolilo. Mossy wet wall of sinkhole on side of ridge. 1200 m. 21 Dec 1932. *St. John 12379 et al.* (BISH).—Maui: Ahapuaa of Kalialinui, between Puu o Kakae and Puu Nianiau, in closed *Metrosideros*-dominated mesic forest, along upper boundary of Makawao Forest Reserve. Growing in gulch in shade with *Athyrium*. 1967 m. June 1975. *P. Higashino 714* (2 sheets, HAW); Eastern end of Haleakala Crater in upper Kaupo Gap. Growing in shaded gulch of aa lava. With *Styphelia, Vaccinium, Coprosma, Dodonaea, Metrosideros*, etc. Infrequent. 16 June 1969. *J. Hendrickson & Richard Vogl* (BISH); NW slope of Puu Kukui. Nahalalua. 28 July 1938. *L. M. Cranwell & C. Skottsberg 2713* (BISH).—Hawaii: Kau District. Kilauea Forest Reserve, 1 mi W of Kulani Cone. NW corner of IBP Study Site. On fallen logs. 1650 m. 18 Jan 1971. *Lamoureux 4429* (HAW). Slope of Mauna Kea, in wet forest. 1500–1800 m. Jan. 1958. *J. F. Rock & T. Lindsay 12* (BISH). Along Saddle Road, 19 mi from Hilo. In dark rainy kipuka. 29 Aug. 1949. *O. Degener et al.* (BISH).

This species exists in dark, moist woods, probably on all of the five largest islands. It is much less common than *Asplenium normale* Don, which usually grows in drier more exposed sites and with which it has traditionally been confused. The following key will separate them.

FIG. 1. *Arachniodes insularis* W. H. Wagner. E. Maui, Makawao Forest Reserve; *Wagner 5185* (MICH).

Proliferations solitary at the aborted tip of the frond, protected by a single infolded pinna. Pinnae 10–22 mm long, elongate, triangular, with more or less rounded pointed tips and well-developed pointed anterior basal auricle; anterior margin shallowly or strongly dentate, with 6–12 marginal projections. Sori with delicate thin indusia. Chromosome number: n = ca. 144. *A. normale.*

Proliferations 1–5 scattered along the upper rachis, not protected by infolded pinnae. Pinnae 5–12 mm long, oblong, with mostly truncate tip and no or poorly developed rounded anterior basal auricle; anterior margins shallowly crenate, with 3–5 marginal projections. Sori with prominent thick indusia. Chromosome number: n = 72. *A. hobdyi.*

Cheilanthes takeuchii W. H. Wagner, sp. nov.

C. decipienti similis sed lamina elliptica; rachis plerumque exalata, quam costa basalis 1.9–2.6plo longior, parte prima quam secunda 1.9–3.1plo longiore; pinnae plerumque brevistipitatae vel sessiles; sori pacne vel omnino circum apices segmentorum extensi.

Small tufted terrestrial fern. Rhizome compact 0.3–1.4 × 0.3–0.8 cm including 5–25 stipe bases plus root bases. Scales 2.5–3.5 × 0.4–0.7 mm at base, becoming very narrow in upper 1/3 to 2/3, cells at base thin, pale brown, those in narrowed upper part with a central strip of dense, occluded, black cells. Frond elliptic-deltate to elliptic, 10–25 × 3–8 cm including stipe. Rachis wiry, 2.1 (1.9–2.6)× the length of the basal costa, dark maroon to blackish, non-winged in lower sector, the lowest rachis sector 2.7 (1.9–3.1)× as long as the next sector. Blades pinnate to bipinnate. Pinnae mostly opposite, sessile to short-stalked. Pinnules and segments 2–8 mm wide, ovate to linear, approximately parallel-sided, or only slightly tapering to tip. Lamina thick chartaceous, pale green. Marginal coenosori with false indusia running to or stopping just short of tip.

Holotype: Oahu. Diamond Head, open slopes near tunnel, 100–120 m. 22 March 1988. *W. Takeuchi 3824* (MICH).

Other collections: Same locality. Jan. 1988. *Takeuchi & Pyle 1200* (MICH); plants completely dried and brown. 5 June 1991. *Wagner 91009* (MICH).

This curious plant is known only from Diamond Head Crater where it apparently grows only during the winter, the fronds drying up through spring and fall. Its frond outline (Fig. 2) is more like typical species of *Cheilanthes* than the sister species in Hawaii, *C. decora* (Brack.) Tryon & Tryon and *C. decipiens* (Smith) W. H. Wagner. The new species is most likely to be confused with the latter.

Blades sub-triangular, the rachis length 1.5 (1.3– 1.6)× the basal costa length, almost completely pinnatisect, the pinnae mostly adnate; rachis mainly winged, the first sector 1 (0.7–1.3)× as long as the second; most sori running to 0.5–2 (–4) mm of segment tips. *C. decipiens.*

Blade elliptic-deltate to elliptic, the rachis length 2.1 (1.9–2.6)× the basal costa length, 1–2-pinnate, the pinnae mostly short-stalked or sessile; rachis mainly non-winged except distally, the first sector 2.7 (1.9–3.1)× as long as the second; most sori running completely or very close (0.1–0.2 mm) to the segment tips. *C. takeuchii.*

Diellia pallida W. H. Wagner, sp. nov.

A *D. falcata* basi stipitis sparsim squamosa differt, squamis 3–5 × 0.7–1.7 mm, brunneis vel griseis, sine cellulis nigris occlusis; frons quam stipes 3–5plo longior; pinnae basales deltatae et vix redactae.

Small or medium-sized fern of dry, rocky soils with 2–5 upright fronds. Rhizome nearly erect, straight, 1.5–4.0 × 2.0 cm including 3–4 stipe bases plus several dead rachises. Scales brown, gray, or blackish, the cells rarely occluded in central

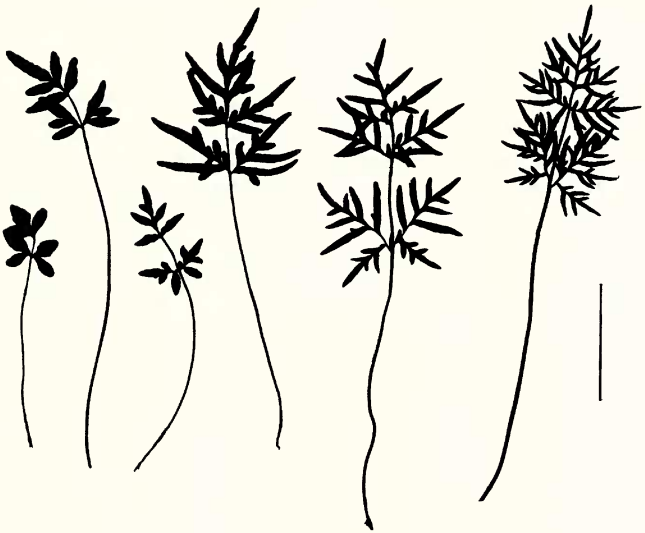

FIG. 2. *Cheilanthes takeuchii* W. H. Wagner. Oahu, Diamond Head; *Wagner 91001* (MICH). Silhouettes of leaves showing variation. All fronds soriferous except the left. Bar = 5 cm.

area, 3.0–5.0 × 0.7–1.7 mm. Fronds oblong-lanceolate, 20–60 × 5–12 cm. Stipes and rachises brown to pale tan, the surface dull, the surface cells thin-walled. Stipes 10–18 × 0.1–0.3 cm, with very few scales at base. Pinnae simple and straight margined or somewhat undulate or laciniate in luxuriant fronds. Blade tip formed by a simple terminal pinna. Venation strongly anastomosing in the disk, with 2–3 layers of areoles in the basal half of pinnae. Sori variable, commonly more or less fused into coenosori, 0.5–20 mm long, marginal to nearly medial.

HOLOTYPE: Kauai. Mahanaloa Valley, *Wagner 5805* (MICH).

Other collections: KAUAI: Koaie Stream, Waimea Canyon. 3 June 1972. *L. E. Bishop 1305* (HAW); 5 July 1987. *J. Lau 3100* (BISH).

Recent studies have confirmed that *Diellia laciniata* (Hillebr.) Diels is actually a variant of *D. erecta* Brack. The most distinctive feature of *D. pallida* as compared with *D. laciniata* is the light color of the rachis, the palest of all the species. This was confirmed by a study of specimens grown in a greenhouse at the University of California Berkeley, during the years 1950–1952, a voucher specimen of which is deposited in the Harvard Herbaria. The specimen shows that even in greenhouse cultivation, the rachises remain pale because of the absence of black, occluded surface cells. The type of *D. laciniata*, "Ida's Fern, *Lindsaya falcata* var. Knudsen 89 (B)" has black, shiny rachises. Isotypes recently found in storage at the Bishop

Museum show the same condition. In addition, one of the fronds from "Ida's Fern" is entirely non-laciniate and corresponds to typical *D. erecta* except for a greater than usual tendency toward coenosoral fusion. Accordingly we have named as a new species the Kauai plant that is analogous to *D. falcata* of Oahu.

Because no individuals were observed in the single area known for this species (Mahanaloa and Paaiki Valleys, western Kauai, *Wagner 3495, 5805*) since their discovery in the later 1940's, it was assumed that it had become extinct. However, in 1987, Lau discovered a new area for it in Koaie stream valley on the eastern side of Waimea Canyon, at an elevation of 600 m, some nine kilometers to the east of the original locality. A few plants were found on a steep slope in bare soil at the base of a tree in a mixed mesic forest slope with little ground cover. Associated plants included *Acacia koa, Antidesma, Alectryon, Lantana, Melia,* and *Rauwolfia.* Some gametophytes with tiny sporophytes were also seen adjacent to a mature plant. Later, an unidentified specimen (*L. E. Bishop 1305*) from presumably the same locality was located in the University of Hawaii Herbarium.

The closest relative of *D. pallida* is the much more widespread and common *D. falcata* Brack. of Oahu. The following key will separate them.

Stipe base very scaly, the scales 3.0–7.0 × 1.5–3.0 mm, black with occluded cells; thin-walled scales common to abundant on upper stipe and rachis; stipe usually 1/8–1/6 of total frond length; basal pinnae round and usually much reduced; sori mostly separate and borne on short marginal proliferations. *D. falcata.*

Stipe base sparsely scaly, the scales 3.0–5.0 × 0.7–1.7 mm, mainly brown to gray, with no or rarely a few occluded cells in the central area; thin-walled scales sparse or absent on upper stipe and rachis; stipe usually 1/5–1/3 of total frond length; basal pinnae deltate and only a little shorter than those above; sori frequently fused along a line or situated medially below shallow sinuses. *D. pallida.*

Dryopteris tenebrosa W. H. Wagner, sp. nov.

D. glabram minutam simulans sed squamis rhizomatis inconspicuis, 2–5 × 0.3–0.6 mm; frons fertilis oblongo-lanceolata, 5–12 × 0.7–4.0 cm; pinnae lineari-oblongae vel lineari-lanceolatae, usque ad 2.5 × 1.3 cm; segmenta ultima 0.5–1.4 mm lata.

Minute tufted lacy fern of steep dark mossy banks. Rhizome upright, up to 2.0 × 0.8 cm. Stem scales up to 4.0 × 0.4 mm, inconspicuous or invisible, buried among leaf bases and roots, triangular, castaneous, shiny. Fertile fronds 3.0–12.0 × 0.7–4.0 cm. Blades linear-lanceolate to oblong-lanceolate, 1–2- (–3)-pinnate. Stipes extremely narrow, 0.3–2.0 cm long, densely clustered, up to 35 per plant, including remains of previous year's, essentially glabrous, except for a few scattered deciduous scales on teneral fronds. Rachis with wing 0.2–0.3 mm thick. Pinnae linear-oblong to linear-lanceolate, up to 2.5 × 1.3 cm, simple to lobed or pinnate, ultimate lobes or segments if present up to 0.5 × 1.4 mm. Texture thin-coriaceous. Sori borne on fronds as small as 3.0 × 0.7 cm, nearly marginal on acutely pointed lobes. Chromosome number: $n = 41$.

Holotype: Kauai: NaPali-Kona Forest, Kilohana Trail. Kauaikoi Stream. 1200 m. 18 August 1947. *Wagner 5574* (MICH).

Other collection: Type locality. 9 April 1987. *Wagner 87186,* 2 sheets (MICH).

The description is based on 20 plants from a single locality (Fig. 3). This tiny *Dryopteris* grows in colonies near water in deep shade on rocky stream banks,

FIG. 3. *Dryopteris tenebrosa* W. H. Wagner. Kauai, NaPali-Kona Forest; *Wagner 87186* (MICH). Bar = 5 cm.

associated with *Sadleria squarrosa* (Gaud.) Maxon, *Callistopteris* sp., and small plants of *Dryopteris glabra* (Brack.) Kuntze to which the new species is no doubt related. *Dicranopteris linearis* (Burm.) Underw. forms a canopy at the top of the bank. The population has been observed for over four decades.

The new species is contrasted with its nearest relative in the following key:

Stem scales inconspicuous, mostly buried below leaf bases, 2.0–4.0 × 0.2–0.4 mm; fertile fronds linear-lanceolate to oblong-lanceolate, 3.0–12.0 × 0.7–4.0 cm; rachis 0.2–0.3 mm wide; pinnae linear-oblong to linear-lanceolate, up to 2.5 × 1.3 cm; ultimate segments 0.5 × 1.4 mm; texture thin-coriaceous. *D. tenebrosa.*

Stem scales conspicuous, exposed above leaf bases, 8.0–10.0 × 0.3–0.6 mm, fertile fronds triangular-lanceolate, 10–30 × 4–12 cm; rachis 0.4–1.2 mm wide; pinnae up to 5.5 × 3.5 cm; ultimate segments 4.9 × 2.3 mm wide; texture chartaceous.
D. glabra (deep shade form of steep, mossy banks).

The rather similar plant named *Dryopteris parvula* Robinson (1912, p. 593, pl. 44) is described as having "both surfaces of blades and stipes covered with globular glands." Its status is still unknown.

Dryopteris subbipinnata W. H. Wagner & R. W. Hobdy, sp. nov.

D. wallichianam simulans sed pinnis plerumque imbricatis; segmenta proximalia basi humiliter vel profunde lobata, apice rotundata; fasciculus venarum in quoque segmento distaliter 4–5-partitus.

Coarse leathery scaly terrestrial fern. Rhizome up to 35 × 20 cm including old stipe bases; stem apex covered with dense masses of linear scales highly variable in size, 1.0–2.0 × 0.1–0.2 mm (at base), central cells glossy black, lateral cells orange-brown to chestnut-brown. Fronds up to 1.3 × 0.4 m including stipe. Stipes up to 35 cm, the scales like those of stem but smaller and narrower, 3.0– 8.0 × 0.5–1.0 mm. Blades pinnatisect above, pinnate below; tip formed by gradual reduction; blade base somewhat narrowed with several lower pairs of pinnae 2/3 (–1/2) the length of those above. Rachis densely covered with narrow scales like those of

upper stipe. Pinnae in lower 1/2 to 1/3 of blade shallowly to deeply (up to 1/2) cut; segments of adjacent pinnae 15–25 × 5–10 mm, shallowly to deeply lobed, usually overlapping in middle and lower part of blade. Segments of lower part of blade contracted at base or stalked. Costae finely scaly, the scales very narrow 0.2–0.5 mm long. Texture coriaceous; color pale green (alive). Venation free, the veinlet trusses in proximal blade segments usually producing 4–5 endings. Glands absent. Sori round, mostly 5–7, 0.5–1.0 mm in diameter with reniform indusia. Spores normal. Chromosome number: $n = 123$.

HOLOTYPE: E. Maui. Haleakala. Koolau Gap. Ainahou Valley. Ca. 1550 m. Growing with much more common *D. wallichiana*. 10 Aug. 1965. *Wagner 65450* (1 frond on 3 sheets-MICH).

Other collections: E. MAUI: Haleakala. Wai Anapanapa, Kipahulu-Kuhewa Divide. 2000 m. Rainforest at tree line. 16 Aug. 1945. *St. John & Mitchell 21034* (US). Paliku, woods, 4 June 1955. *Degener et al. 27406* (US). Keanae Gap. Halehaku. 2 Aug. 1919. *Forbes 971M* (US).—W. MAUI: Between Haelaau and summit of Puu Kukui, along trail near bogs. 25 July 1965. *Wagner 65392* (MICH).

This striking fern (Fig. 4) remained unnoticed until the senior author recognized its distinctive features in the 1940's. Collectors have identified it as *Polystichum hillebrandii*, *Dryopteris paleacea*, *D. fusco-atra*, and *D. hawaiiensis*. In his earlier Hawaiian checklists, Wagner gave it the provisional name "*D. pseudopaleacea*," but the name *D. wallichiana* (Spreng.) Hyl. has nomenclatural precedence over *D. paleacea* (Sw.) C. Chr. The following key places *D. subbipinnata* in comparison with what are its most similar relatives.

1. Rachis scales grayish to blackish, mostly less than 1 cm long; upper pinnae usually not overlapping rachis, gradually narrowing from base to apex; lower pinnae only slightly reduced; medial veins mostly unbranched; sori mostly 2–4 pairs per segment. *D. fusco-atra.*
1. Rachis scales orange-brown to dark chestnut, the largest reaching over 1 cm long; upper pinnae usually overlapping rachis, almost parallel-sided in lower 2/3; lower pinnae commonly 1/3 to 2/5 the length of the medial pinnae; medial veins mostly 1–3-branched; sori mostly 4–7 pairs per segment.
   2. Medial and lower pinnae not overlapping; segments in lower part of blade completely adnate, 8–12 × 2–4 mm, unlobed, sharply truncate; segment vein trusses with 2–3 endings. *D. wallichiana.*
   2. Medial and lower pinnae overlapping; segments in lower part of blade more or less contracted or stalked at base, 15–25 × 5–10 mm, shallowly to deeply lobed, rounded at apex; segment vein trusses with 4–5 endings. *D. subbipinnata.*

Grammitis forbesiana W. H. Wagner, sp. nov.

G. hookeri simulans sed soris in medio laminae et lamina in stipite 0.5–2.0 cm longo gradatim decrescenti; pili in lamina stipiteque pro parte maxima 0.5–2.0 mm longi; sporae 80–100 μm in diametro.

Tufted epiphyte. Rhizome upright, 0.5–1.3 × 0.2–0.4 cm. Stem scales densely overlapping, pale tan concolorous, 2.0–3.0 × 0.3–0.4 mm, with scattered minute capillary hairs. Roots very narrow, black, branched. Frond linear 10–17 × 0.5–1.0 cm. Hairs on blade and stipe frequent to common, stiff black, 0.5–2.0 mm long. Stipe wiry, dark brown mostly 0.5–2.0 cm. Blade simple, narrowed apically and basally, reducing gradually to stipe. Margins entire. Texture thick, fleshy, dark green, blade readily cracked when bent. Sori medial, subelliptic in early development becoming circular at maturity. Capsule paraphyses 1–2 minute stiff black hairs, frequent to sparse. Spores spherical, diameter mostly 80–100 μm.

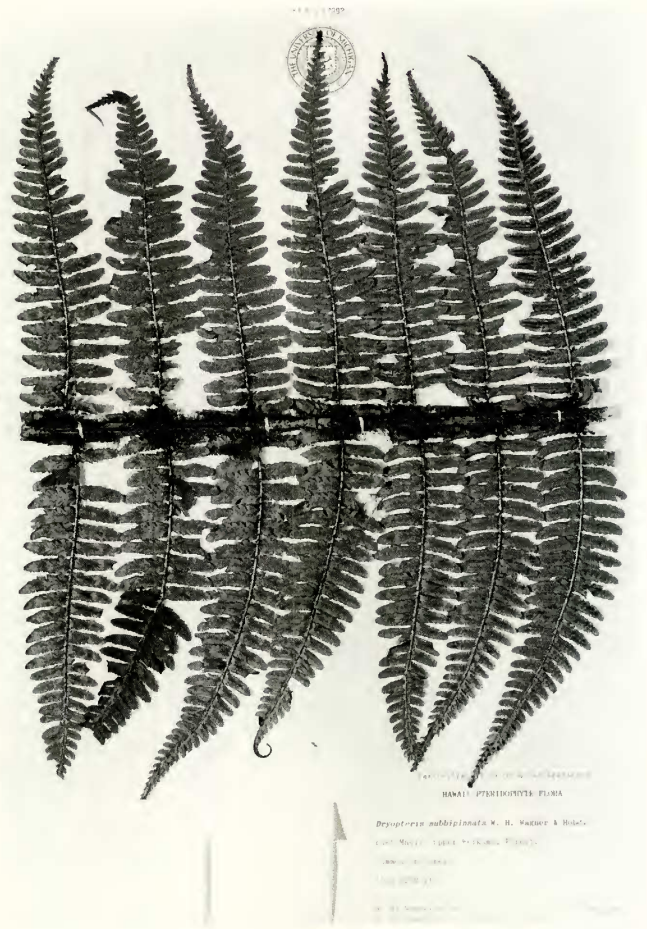

FIG. 4. *Dryopteris subbipinnata* W. H. Wagner & R. W. Hobdy. Maui, Upper Waikamoi Forest; *Wagner 87135* (MICH). Central part of blade. Note overlapping, lobed segments.

HOLOTYPE: W. Maui. Trail between Haelaau and summit of Puu Kukui. 25 July 1965. *Wagner 65386* (MICH).

Other collections: OAHU: Koolau Range; Hauula Range, Kaluanui Stream. 500–600 m. 31 Aug. 1947. *Wagner 5767* (MICH).—MOLOKAI: No locality. *Rock 6161* (MICH); Near Hanilolilo, S rim of Waikolo Valley. 5 July 1964. *Crosby & Anderson 1683* (MICH); Pukoo. July 1912. *Forbes 271Mo* (MICH).—W. MAUI: Puu Kukui, woods above Haelaau. 1200 m. 29 June 1948. *Wilbur & Webster 926* (MICH); *Hitchcock 14766* (US); Gulch and ridge overlooking Hokuula, 1 mi N of Puu Anu. 25 July 1947. *Wagner 5395* (MICH).—E. MAUI: Flume Trail. Olinda Water Reserve. 16 August 1951. *H. L. Bonsey 2196* (MICH); 20 April 1963. *Sparrow & Bonsey* (MICH); Olinda Flume, Waikamoi. 16 July 1964. 1200 m. *Crosby & Anderson 1758* (mixed with *G. hookeri*, MICH).

This previously overlooked fern is obviously intermediate between *Grammitis baldwinii* (Baker) Copel., a species known today only from Kauai, and *G. hookeri*, widespread throughout the islands. The most conspicuous intermediate characters are soral position, frond shape, stipe length, hair incidence and length, and paraphyses. E. B. Copeland noted the soral position. He annotated the Hitchcock specimen in the U.S. National Museum "sori remote from costa." Hillebrand had observed this earlier; his "β var." of *Polypodium hookeri* (1888, p. 553) described the sori as "midway between rib and edge" as opposed to taxon *hookeri* with sori "forming two rows close to the midrib."

1. Sori submarginal; stipe very short, usually less than 1/30–1/8 of the frond length; frond essentially glabrous except at base; capsular paraphyses abundant in sori. *G. baldwinii.*
1. Sori medial or costal; stipe larger mostly 1/15–1/3 of the frond length; frond with numerous and conspicuous stiff, black hairs; capsular paraphyses frequent to sparse in sori.
   2. Sori medial; lamina subcoriaceous reducing gradually to stipe mostly 0.5–2.0 cm long; hairs on blade and stipe frequent to common, mostly 0.5–2.0 mm long; spore diameter 80–100 μm. *G.* [×] *forbesiana.*
   2. Sori costal; lamina chartaceous reducing more abruptly to stipe mostly 1–6 cm long; hairs on blade and stipe common to abundant, mostly 2–3 mm long; spore diameter 60–75 μm. *G. hookeri.*

×**Lindsaeosoria flynnii** W. H. Wagner, nothogen. et nothosp. nov.

Planta inter *Lindsaeam ensifoliam* et *Odontosoriam chinensem* intermedia; lamina 2-pinnata, prope medium abrupte decrescens; pinnae crispatae; lamina pinnaeque ambito maxime irregulares; pinnulae stipitatae pinnae basalis 1–4; sporae abortivae.

Hybrid between *Lindsaea ensifolia* and *Odontosoria chinensis*. Tufted terrestrial fern with spreading to upright fronds. Rhizome short-creeping, 1–2.5 mm thick. Stem fibrils very narrow, several cells wide at base, reddish brown. Fronds including stipe 10–45 × 3–7 cm. Stipe 3–15 cm long. Blade narrowly lanceolate, 1 (–2)-pinnate, the tip attenuate, usually reduced abruptly beginning at middle of blade. Pinnae 1.0–10.0 × 0.5–2.0 cm with stalks up to 2 mm long. Pinna bases cuneate, gradually contracting to stalk. Lamina thick chartaceous, pale green. Stalked pinnules on basal pinna 1–4. Venation free except for rare anastomosis of veins under fused sori. Sori mainly separate, 0.3–0.9 mm long. Indusium 0.3–1.5 mm long (in fused sori). Spores abortive.

HOLOTYPE: Kauai, northeast of Keahili Mt. Park, in an abandoned litchi orchard. 12 April 1987. *Wagner 87211* (MICH).

Other collection: Same locality. 26 August 1987. *Flynn 2351* (MICH, PTBG).

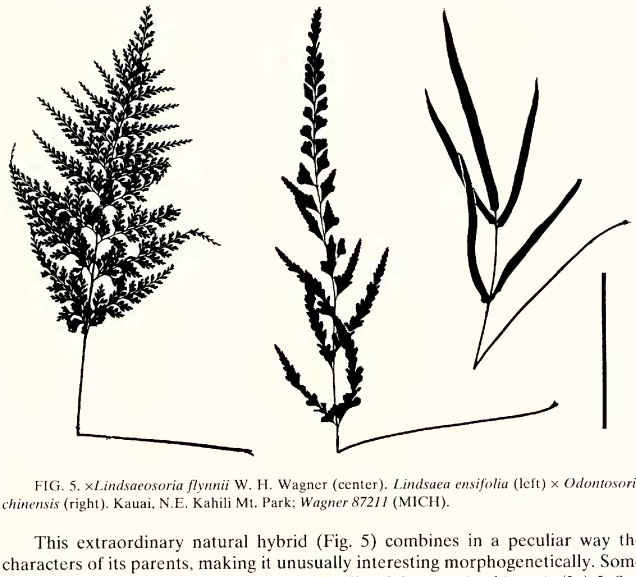

FIG. 5. ×*Lindsaeosoria flynnii* W. H. Wagner (center). *Lindsaea ensifolia* (left) × *Odontosoria chinensis* (right). Kauai, N.E. Kahili Mt. Park; *Wagner 87211* (MICH).

This extraordinary natural hybrid (Fig. 5) combines in a peculiar way the characters of its parents, making it unusually interesting morphogenetically. Some of the characters, as shown in Table 1, are like *Odontosoria chinensis* (L.) J. Sm. (e.g., free veins), or intermediate with *Lindsaea ensifolia* Sw. (e.g., pinna stalk length); others are unlike either parent (e.g., pinna bases). In general the hybrid seems more like *Odontosoria*. The latter, it should be noted, has the majority of primitive or plesiomorphous characters, and they appear to dominate in the hybrid (cf. Wagner 1962).

Microlepia mauiensis W. H. Wagner, sp. nov.

A *M. strigosa* frondibus utrinque dense pubescentibus differt; rachides costaeque flexuosae; segmenta 2–3plo longiora quam latiora, rotundata.

Medium- to large-sized, hairy terrestrial rainforest fern. Rhizome creeping, the fronds borne at intervals of 0.8–1.0 cm. Rhizome tip with uniseriate hairs densely massed, 1–3 mm long, white to brown. Frond elongate-deltate, up to 100 × 30 cm, including stipe. Stipe up to 50 cm, more or less densely hairy. Blade 3-pinnate, tip formed by gradual reduction. Rachis 1.5 (1.2–1.8) mm thick 20 cm from frond apex. Rachis and costae mostly flexuous, densely hairy, brownish (due to admixture of partially or wholly pigmented hairs). Pinnae linear-deltate, narrowing uniformly from base. Segments ovate to oblong, usually 2–3× as long as broad, the apices somewhat rounded. Lamina chartaceous, hairy both below and above, the hairs on adaxial side not confined to margins. Color pale green, but dull due to numerous hairs. Venation free. Sori submarginal, on tips of veins that do not reach margin. Indusium semicircular, opening outward, hairy, attached at base.

TABLE 1. Comparison of an intergeneric hybrid with its parents.

	Odontosoria chinensis	*×Lindsaeosoria flynnii*	*Lindsaea ensifolia*
Occurrence	Usually by itself	Only with parents	Usually by itself
Incidence	Abundant	Only 8 plants seen	Abundant
Patchiness	Separate	Separate	Continuous clones
Fronds	Tufted	Tufted	Not tufted
Orientation	Spreading	Spreading to upright	Upright
Petiole	Pale pink	Purple	Purple
Blade cutting	3-pinnate	2-pinnate	1-pinnate
Tip formation	Gradual reduction in symmetry	Sudden reduction at middle of blade	Conform terminal pinna
Exaggerated basal pinna pairs	0	1–3	1–6
Basal pinna orientation (alive)	Spreading	Nearly erect	Erect
Lamina	Smooth	Crispate	Smooth
Symmetry	Regular	Highly irregular	Regular
Pinna stalk (mm)	2–3	1–2	0.5–1
Stalked pinnule pairs on two basal pinnae	6–16	0.5–2	0
Pinna bases	Abruptly contracted	Gradually tapered	Abruptly tapered
Ultimate pinnae and segment shapes	Cuneate	Cuneate to flabellate	(No secondary segments)
Number of veins in ultimate segments or lobes	2–4	3–12	(No secondary segments)
Venation	Free	Free (marginal fusions rare)	Reticulate (1–3 layers of areoles)
Sorus	Discrete, 0.3–0.9 mm	Discrete, 0.3–0.9 mm, to rarely fused, up to 1.5 mm	Coenosoral
Soral margin	Plane	Somewhat revolute	Revolute
Spores	Normal	Abortive	Normal

HOLOTYPE: W. Maui. Hanaula. In wet forest above reservoir. Hairy form with zig-zag rachis. 1279 m. 25 March 1984. *Wagner et al. 87107a* (2 sheets, MICH).

Other collections: W. MAUI: Type locality. 31 Oct. 1984. *Hobdy 2206* (MICH). Mauna Wainui Plant Sanctuary. 850 m. 1983. *Hobdy 1848* (BISH). Upper Poe Lua Gulch. 425 m. 1984. *Hobdy 2091* (BISH).—E. MAUI: Yhou Gulch, above Makawao. 1035 m. 1980. *Hobdy 766* (BISH).—HAWAII: Manuka, in kipuka. 1400 m. 1977. *P. Higashino 6219* (BISH). Puu Makalua. 1991. 1310 m. *Palmer 636* (BISH). Kau Forest Reserve, above Kapapala Forest Reserve. 1310 m. 1991. *Palmer 624* (BISH).

This very rare and local taxon (known at present only from Maui and Hawaii) differs in so many conspicuous characters (Fig. 6) from the abundant and widespread *M. strigosa* (Thunb.) Presl that it cannot be maintained as a variety, even though occasional plants of the latter show some apparent introgression toward it. The following key will distinguish the rare from the common species.

Fronds sparsely hairy, the rachises and costae whitish yellow or green at maturity; rachis 1.3 (0.8–1.6) mm thick 20 cm from frond apex; rachises and costae non-flexuous; segments mostly 2.5–4.0× as long as broad, more pointed, hairy only on abaxial side or if hairy on adaxial side the few hairs usually submarginal; elevation widely variable from near sea level upward, habitats mostly dry to moderately wet. *M. strigosa.*

Fronds densely hairy, the rachises and costae reddish brown at maturity; rachis 1.5 (1.2–1.8) mm thick 20 cm from frond apex, but appearing thicker due to dense hairs; rachises and costae flexuous; segments mostly 2–3× as long as wide, rounded, strongly hairy on both surfaces, the hairs not only submarginal; elevations around 1200 m or above, habitat extremely wet. *M. mauiensis.*

Polystichum bonseyi W. H. Wagner & R. W. Hobdy, sp. nov.

A *P. haleakalensi* pinnis proximalibus quam pinnis medianis plerumque fere aequilongis differt; squamae rhizomatis stipitisque rubellae et in medio vulgo vitta atra instructae; exospora 50 (40–60) µm longa.

Coarse fern of mainly open rocky habitats. Rhizome compact, short, creeping, the apex and petiole bases densely covered with pale tan scales up to 1.0 × 0.5 cm, a few of the larger ones with irregular longitudinal medial streaks of shiny blackish brown. Scales becoming smaller and narrower in upper petiole, forming fibrils 1.0–3.0 × 0.1–0.3 mm. Blade bipinnate, up to 100 × 12 cm, narrowly lanceolate, but the lowest pinna pairs usually nearly or quite unreduced, approximately equal in length (only occasionally reduced to 2/3) to the middle pinnae. Rachis densely reddish fibrillate. Lamina chartaceous, the upper surface glabrous, the lower with scattered long multicellular hairs. Margin not strongly cartilaginous, strongly spinulose, with 7–11 projections per pinnule, these mainly 0.5–1.0 mm long. Pinnules 0.8–1.3 cm long, but the first acroscopic pinnule 1.0 –1.3× the length of the second acroscopic pinnule. Angle of the pinnules ca. 40°–50° to the costa. Sori ca. 1 mm across when mature. Indusia becoming folded (when dry) margins somewhat irregular due to projection of 1-celled hairs. Spores 40–60 µm long. Chromosome number: $n = 164$.

HOLOTYPE: E. Maui. W side of Puu Nianiau, steep rocky gulch. 2000 m. 9 July 1947. *Wagner 5226* (MICH).

Other collections: E. MAUI: Crater Road, in a gulch above the road, 1900 m. 3 Mar. 1985. *R. Hobdy 2295* (BISH); Plum Trail, Polipoli. 1700 m. (3 specimens) *R. Hobdy 377* (BISH); Kula, in a shady gulley near the Polipoli Access Road, 1700 m. In company with *P. hillebrandii*. 17 Apr. 1984.*R. Hobdy 2061* (BISH). Eastern Outer Rim of Haleakala Crater, 2 mi NE of Paliku Cabins, in shaded rainforest along ridge north of Wai Anapanapa. Rosette fern at edge of deep gulch with *Metrosideros, Pelea, Myrsine, Rubus, Cheirodendron, Coprosma, Sadleria, Styphelia*. Common. 2000 m. 18 June 1969. *Henrickson & Vogl 3520* (BISH).—HAWAII: N. Kona. Hualalei. Plants growing in

FIG. 6. *Microlepia mauiensis* W. H. Wagner. E. Maui, Hanaula; *Wagner 87107a* (MICH). Note thick flexuous rachis.

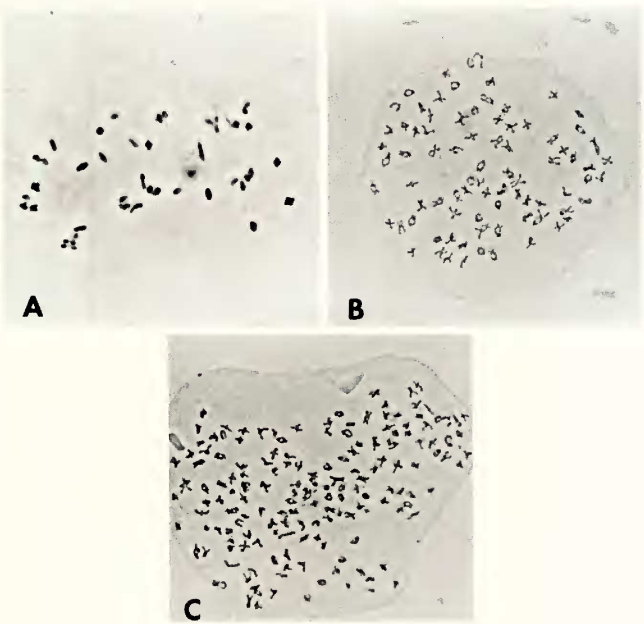

FIG. 7. Chromosomes of Hawaiian *Polystichum*. A. *P. hillebrandii*, $n = 41$; B. *P. haleakalense*, $n = 82$; C. *P. bonseyi*, $n = 164$.

very deep cinder cone, water dripping from side, moist area. Vegetation: *Metrosideros, Raillardia, Stenogyne, Styphelia*. 26 Nov 1977. *Higashino 6623* (BISH).

We have only a single record from the island of Hawaii. It is interesting to note that the only occurrence is on Hualalei, not on either Mauna Kea or Mauna Loa. In Maui, *Polystichum bonseyi* is found throughout the mesic forest zones of the south and west slopes of Haleakala and well up into the subalpine zones as well. It also occurs in the rainforest-subalpine ecotone across the north slope and east end of the crater. Here it reaches its best development (in size and vigor but not in numbers). The plants prefer open sunny ledges near gulch bottoms but also occur in forest understory in gulch bottoms and occasionally on ridgetops in the wetter part of its distribution. Of the three species of Hawaiian *Polystichum*, this is perhaps the commonest. In ideal sites it sometimes becomes gregarious, usually associated with *Dryopteris wallichiana*. The elevational range of *Polystichum bonseyi* is 1400–2000 m, and the rainfall range is 40–100 inches. The three native species of this genus differ in chromosome number: *P. hillebrandii* Carruth., $n = 41$; *P. haleakalense* Brack., $n = 82$; and *P. bonseyi*, $n = 164$ (Fig. 7).

1. Fronds very leathery, shiny; pinnule margins cartilaginous, marginal projections absent or small; largest petiole scales broadly ovate, very large and overlapping; indusium with nearly entire margin; exospores 30 (25–35) μm long. *P. hillebrandii.*
1. Fronds papery or herbaceous, dull; pinnule margins non-cartilaginous with strong marginal projections; largest petiole scales narrow, lanceolate and interspersed with linear fibrils; indusium with marginal projections; exospores various in length.
   2. Lower pinnae usually reduced to 1/3 or 1/4 the length of the medial pinnae; rhizome and lower stipe scales pale whitish gray or brown, concolorous; exospores 35 (25–45) μm long. *P. haleakalense.*
   2. Lower pinnae usually nearly equal to the length of the medial pinnae; rhizome and lower stipe scales more reddish, and commonly with a dark stripe; exospores 50 (40–60) μm long. *P. bonseyi.*

Pityrogramma [×] **mckenneyi** W. H. Wagner, nothosp. nov.

Planta inter *P. austroamericanam* et *P. calomelanos* intermedia; a *P. calomelanos* farina flavido-alba differt; auriculae pinnularum magnarum usque ad 1 mm longae; porcae adaxiales rachidis atropurpureae tantum in tertio proximali; sporae abortivae.

Tufted medium-sized terrestrial fern of weedy places. Rhizome upright 2.0 × 1.0 cm including stipe bases and roots. Stem scales extremely narrow, 4.0–6.0 × 0.1–0.3 mm at base, becoming 1–2-celled in upper 1/3–2/3. Roots narrow, black, few-branched, producing proliferations. Fronds somewhat spreading, broadly lanceolate, up to 105 × 20 cm including shiny, dark glabrous stipe up to 35 cm. Blade oblong-lanceolate, bipinnate to tripinnate. Rachis green except for dark purple color on adaxial ridges in lower third. Pinnae attenuate triangular 3.0–10.0 × 1.0–2.0 cm, with stalks up to 3.5 mm. Pinnules in proximal area shallowly auricled; pinna tips more or less pointed; margins subdentate. Texture subcoriaceous. Adaxial lamina surface shiny green, the cells long and narrow, fiberlike; abaxial surface pale whitish yellow due to numerous globular farina glands. Sorus acrostichoid, the sporangia scattered, non-indusiate. Spores abortive.

Holotype: Oahu. Kaneohe, Hoomaluhia Botanical Garden. On hillside above Loho Wainaluhia Reservoir. Extremely abundant, with parents. March 1987. *Wagner 87173* (MICH).

A beautiful, very vigorous intermediate between the silverback fern, *Pityrogramma calomelanos* (L.) Link, and the goldback, *P. austroamericana* Domin, to be expected wherever the parents co-occur. In spite of its sterility, it is reproductively competent, producing colonies by its strong ability to propagate by roots. It is here keyed out with its parental species.

1. Farina deep golden yellow: mature living plant with spreading leaves; blades mostly bipinnate; basal pinnules usually not auricled; segment tips usually rounded; margin entire to subentire; lowest pinnae with stalks 4–6 mm long; usually only the lower 1/4 to 1/5 of the adaxial ridges on the midrib dark purple, the remainder greenish; texture subcoriaceous. *P. austroamericana.*
1. Farina white or whitish yellow; mature living plant with upright to somewhat spreading leaves; blades tripinnate to bipinnate; large basal pinnules usually auricled; segment tips more pointed; margins subdentate to dentate; lowest pinnae with stalks 2–5 mm long; the lower 1/3 to 2/3 of the adaxial ridges on the midrib dark purple, the remainder greenish; texture subcoriaceous to chartaceous.
   2. Farina pure white; lower half or more of the adaxial ridges on the midrib dark purple; auricles on large pinnules up to 2 mm long, pointed; spores normal. *P. calomelanos.*
   2. Farina pale whitish yellow; lower third of adaxial ridges on the midrib dark purple; auricles on large pinnules mostly smaller and rounded; spores abortive. *P.* [×] *mckenneyi.*

Psilotum [×] **intermedium** W. H. Wagner, nothosp. nov.

Planta inter *P. complanatum* et *P. nudum* intermedia; a *P. nudo* ramis partialiter arcuatis, irregulariter planis vel in sectione transversali triangularibus differt; sporangia 2- vel 3-seriata; sporae abortivae.

Tufted terrestrial or epiphytic plants with essentially naked axes. Roots absent. Buried stems mostly 2–3 mm thick, brown with short horizontal branches provided with numerous rhizoids, and upright aerial branches mostly 1.5–2.5 mm thick, green. Typical leaves absent, the upright stems provided with minute simple enations mostly 1–2 mm long. Branchlets varying from nearly upright spreading, to more or less pendent, in cross section from flat and ribbonlike to triangular and cordlike. Sporangia borne terminally on forked appendages slightly larger than the simple sterile appendages. Sporangia very large 1.5–2.0 mm in diameter, fused into tight 3-lobed synangia. Spores abortive, mostly empty, and of diverse sizes and shapes.

HOLOTYPE: Oahu. Waianae Mountains, Kanehoa Trail, SW of Kunia, with parents. Frequent in moss on ridge. 27 August 1961. *Wagner 9615a et al.* (MICH).

Other collections: MAUI: Kipahulu. Summit of west ridge of Kaukana Gulch. Koa woods, at base of koa tree. 500 m. 28 December 1936. *St. John 17811* (MICH).—KAUAI: NW of Kalahao, Kanela Swamp. 650 m. *J. Henrickson 4000* (US).—LANAI: SE of Haalelepaahu, Monaneo Gulch. 850 m. *O. Degener & I. Degener 31151* (US).

The two species of *Psilotum* in Hawaii are remarkably common, *P. nudum* (L.) Beauv. being found even in downtown Honolulu, especially at bases of coconut palms, but *P. complanatum* Sw. is limited to higher altitudes and shadier and moister native habitats. The hybrid (Fig. 8) is widespread and may be expected anywhere that both species occur near each other. The hybrid plants were first noted in 1961, and first reported and illustrated by Wagner in 1968. In some localities the hybrids are quite common, as along certain mossy trails in the Waianae Mountains of Oahu. Presumably their reproduction and dispersal is accomplished by tiny gemmae (brood bodies) produced underground near the rhizome tips.

1. Branchlets mostly strongly arched, entirely flat, their width almost uniform to the apex, 2.3–3.0 mm wide; sporangia 2-ranked in parallel rows on opposite sides of the branchlets; primary aerial stalk 25–70% of length of the branchlet cluster. *P. complanatum.*
1. Branchlets somewhat arched or straight and erect, flat to triangular in section, their width more or less diminishing in distal 5–10 cm, 0.7–2.3 mm wide; sporangia 2-ranked to irregularly or regularly borne around the branchlets; primary aerial stalk 50–300% of the length of the branchlet cluster.
   2. Branchlets partially arched, irregularly flat to triangular in section, their width strongly varying with the outline ca. 1.0–2.5 mm, sporangia fluctuating from 2- to 3-ranked; spores abortive. *P.* [×] *intermedium.*
   2. Branchlets nearly upright, usually not arched except in very large luxuriant epiphytes, regularly triangular in section, their width 0.7–1.2 mm; sporangia mainly 3-ranked; spores normal. *P. nudum.*

Thelypteris ×**incesta** W. H. Wagner, nothosp. nov.

Planta inter *T. dentatam* et *T. parasiticam* intermedia; a *T. dentata* 1–2 paribus pinnarum proximalium redactis, pinnis infimis 5plo longioribus quam latioribus, differt; rachis raro purpurea; segmenti secunda venula antica basi vel supra basim

FIG. 8. *Psilotum* [×] *intermedium* W. H. Wagner (*P. complanatum* × *P. nuda*). Oahu, Waianae Mts. sw of Kunia. Note irregular branch form alternating from flat to 3-angled. (Photograph by Sherwin Carlquist.)

sinus finem habens; glandulae aurantiacae globularesque tantum aliquando praesentes; sporae abortivae; $4x = 144$, sterilis.

Intermediate between *T. dentata* and *T. parasitica*. Medium-sized terrestrial weedy fern with leaves 2–8-tufted on a creeping rhizome. Rhizome 1.0–2.0 cm thick, usually with several old stipe bases. Stem tip scales brown, linear, 4.0–8.0 × 0.5–1.0 mm at base, reducing to a long narrow distal portion. Roots abundant and much branched, 0.5 mm thick down to capillary. Fronds 70–150 × 25–35 cm including stipe. Stipe 20–50 cm long and with few scales like those of rhizome but smaller, scattered on basal 5 cm. Blade lanceolate-oblong, 1-pinnate, with pinnatifid pinnae, 25–35 pairs. Medial pinnae sublinear 7.0–14.0 × 1.4–2.0 cm, cut 1/3–2/3 into segments. Frond apex reduced to a prolonged narrowing tip 5–10 cm long. Basal pinnae frequently somewhat falcate and descending, usually only 1–4, reduced. First rachial sector 5.4 (4.0–8.5) cm. Lamina texture chartaceous, green. Second lateral veinlet on anterior side reaching to or slightly above the sinus base. Sinuses narrow. Minute golden globular glands occasional on abaxial surface of costae. Spores abortive. Chromosome number: $4x = 144$, pairing irregular.

HOLOTYPE: Kauai: Wahiawa. Road below Alexander Dam. Occasional with parents. 10 April 1987. *Wagner 87191* (MICH).

Other collections. E. MAUI: Hanawa Valley , along road from Hanawa Parking Place to Hana Road. 100 m. 28 March 1987.*Wagner 87170.5a* (MICH). OAHU: Koolau Mountains. Mt. Tantalus. Manoa Cliff Trail. Large clone with parents. 4 February 1987. *Wagner 87020* (MICH).

This is probably a relatively common nothospecies throughout the islands, due partly to the abundance of the parents in disturbed places. It tends to grow taller and more vigorously than either of its parents, and this helps in its field recognition. The differences of the hybrid from its parents are rather subtle, and only recently have we been able to detect it easily. Holttum (1977) did not report hybrids between *T. dentata* (Forsk.) E. P. St. John and *T. parasitica* (L.) Fosberg, which themselves are well known, widespread tropical weeds and commonly occur side-by-side in the same habitats.

1. Lower pinnae little or not reduced, linear, the basal ones approximately the same length as the medial ones, and prominently curved upward; first rachial sector averaging 2–3 cm long; medial pinnae usually narrow and cut about 1/2–2/3; lamina color above (alive) yellowish green; rachis color pale green to yellowish; partially fertile pinnae common, with paired sori along the costa; second anterior veinlet usually ending above the base of the sinus; sinuses wide; minute spherical orange glands scattered on the abaxial costae. *T. parasitica.*
1. Lower pinnae definitely reduced, usually 1–4 pairs, the lowest usually 1/2–1/5 as long as the medial ones, mostly not curved; first rachial sector averaging 4–7 cm long; medial pinnae usually broader and cut 1/2–1/3; lamina color above darker than below (alive); rachis color green to purple; partially fertile pinnae with paired sori along costa not common; second anterior veinlet variously ending at or above the base of the sinus; sinuses narrow; minute glands present or absent.
   2. Lower pinnae, usually 1–2 pairs, reduced, the lowest variable in size but averaging approximately 5× as long as wide; first rachial sector mostly 4.5–6.0 cm; lamina color above green; rachis rarely purple; second anterior veinlet ending at or above the base of the sinus; occasional minute orange glands on abaxial costae; spores abortive. *T. ×incesta.*
   2. Lower pinnae, usually 1–4 pairs, reduced, the lowest variable in size but averaging approximately 2.5× as long as wide; first rachial sector mostly 5.5–7.0 cm; lamina color above dark green; rachis commonly purple; second anterior veinlet ending usually at the base of the sinus; glands absent on abaxial costae; spores normal. *T. dentata.*

Thelypteris [×] **palmeri** W. H. Wagner, nothsp. nov.

Planta inter *T. dentatam* et *T. cyatheoides* intermedia; a *T. dentata* fronde 1–2 m alta differt; basis petioli 5–10 mm crassa; rachidis sulcus 2–4 mm latus; pinnae 1/3 fissae, lobis 30–45; paria venarum 6–8 per segmentum, infimum a costa abiens; vena commissuralis flexuosa; sporae abortivae; $3x = 123$, abortiva.

Medium to large weedy fern forming extensive clones. Rhizome creeping, 9–12 mm thick. Scales tufted at apex of stem and crosier, dark gray-brown, elongate-triangular, 3.0–6.0 × 0.5–1.5 mm. Frond narrowly lanceolate, contracted below, 1.0–2.0 × 0.3–0.5 m. Petiole 30.0–50.0 × 0.4–0.9 cm. Middle pinnae 12.0–15.0 × 1.7–2.2 cm, nearly parallel-sided, narrowing in outer third. Blade apex formed by gradual reduction; 3–6 basal pinna pairs reduced. Lobes mostly 30–45 in middle pinnae, rounded, slightly or not at all falcate, 6–8 vein pairs per lobe, the lowest pair beginning at costa, the commissural vein somewhat zig-zag. Sinuses cut 1/3 to 1/2. Fusion of veins of adjacent lobes irregular. Lamina chartaceous, somewhat shiny. Spores abortive. Chromosome number: $3x = 108$, pairing irregular.

HOLOTYPE: Oahu. Koolau Mountains. Palolo Valley Trail up to waterfalls. 1 February 1987. *Wagner 87013* (MICH).

Other collection: OAHU. Mt. Tantalus, north side, along cross-trail. 10 May 1987. *Wagner 87223* (MICH).

This hybrid of *Thelypteris cyatheoides* (Kaulf.) Fosberg and *T. dentata* forms large, widely scattered clones. It is probably much more common than the collections would indicate. It should make a showy, if aggressive, cultivated plant.

Thelypteris [×] *palmeri* is a fine example of a nothospecies that resembles its parent with the tetraploid chromosome number, *T. dentata*, rather than the one with the diploid number. *T. cyatheoides*. For this reason the hybrid is compared with *T. dentata* in the following key.

Fronds 0.5–1.0 m long; pinnae cut 1/2 into 15–25 lobes, each with 5–7 vein pairs; first vein pair arising 0.5 mm from costule; commissural vein mainly straight. *T. dentata.*

Fronds 1.0–2.0 m long; pinnae cut 1/2–1/3 into 30–45 lobes, each with 6–8 vein pairs; first vein pair arising at costule; commissural vein somewhat zig-zag. *T.* [×] *palmeri.*

ACKNOWLEDGMENTS

Special thanks go to the University of Hawaii and the Bishop Museum Departments of Botany for all the kindnesses rendered. The following herbaria supplied the bulk of the collections examined: BISH, GH, MICH, NY, PTBG, and US. The individuals who gave us special assistance in various ways in this project are W. R. Anderson, I. A. Abbott, D. J. Bay, G. D. Carr, L. W. Cudahy, R. W. Hobdy, A. C. Madeiros, J. A. Medler, D. D. Palmer, W. Takeuchi, and the late H. St. John. Florence S. Wagner has participated in all phases of the research, which is supported by NSF Grant BSR 90224535, "Survey and Inventory for the Hawaiian Pteridophyte Flora."

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